

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 111,1807 (2010)	15-Jun-2010

Q(β⁻)=268.1 19; S(n)=6840.6 18; S(p)=5311.6 19; Q(α)=1242.5 23 2012Wa38

Note: Current evaluation has used the following Q record 257 4 6840.7 185310.1 191244.3 23 2003Au03,2009AuZZ.

S(p), Q(α) from 2009AuZZ (5309.9 18 and 1244.5 23, respectively, from 2003Au03).

See 1986Al32, 1987Mi31, and 1988Al04 for recent hfs and isotope shift data.

¹⁶⁸Tm Levels

Band(dF) K^π=0⁻ band (1973Pr06). A=13.9 (J=0, 1, 3 levels). Configuration=((ν 1/2[521])-(π 1/2[411])).

Band(Mr) K^π=2⁻ band. A=12.6 (J=3, 4 levels). Configuration=((ν 5/2[523])-(π 1/2[411])).

Band(Lp) K^π=3⁻ band. A=14.6 (J=3, 4 levels). Configuration=((ν 5/2[523])+(π 1/2[411])) (1973Pr06).

Band(Gt) K^π=0⁺ band. Configuration=((ν 1/2[400])-(π 1/2[411])) (1973Pr06).

Cross Reference (XREF) Flags

A	¹⁶⁷ Er(³ He,d)	E	¹⁶⁹ Tm(γ,n)
B	¹⁶⁷ Er(α,t)	F	¹⁶⁸ Er(d,2nγ), ¹⁶⁵ Ho(α,nγ)
C	¹⁶⁹ Tm(d,t)	G	¹⁶⁴ Dy(¹¹ B,α3nγ)
D	¹⁶⁹ Tm(³ He,α)		

E(level) [†]	J ^π [‡]	T _{1/2}	XREF	Comments
0.0 ^a	3 ⁺	93.1 d 2	AB eFG	$\% \epsilon + \% \beta^+ = 99.990$ 7; $\% \beta^- = 0.010$ 7 $\mu = +0.227$ 11; Q=+3.23 7 $\% \beta^-$: from I _γ (87.7γ in ¹⁶⁸ Yb) relative to I _γ for transitions in ¹⁶⁸ Er (1987Me04). μ : resonance ionization mass spect (1989Ra17 from 1988Al04); value relative to $\mu = -0.2316$ 15 for ¹⁶⁹ Tm (g.s.). Q: resonance ionization mass spect (1989Ra17 from 1988Al04); value relative to Q=+0.74 2 for ¹⁷⁰ Tm (g.s.) (Sternheimer correction included). <r ² > ^{1/2} (charge)=5.217 4 (2004An14). T _{1/2} : weighted average of 85 d 2 (1949Wi03), 95 d 10 (1961Bj02), 93.0 d 5 (1962Bo12), 85 d 10 (1963Fu12), 86 d 3 (1963Ra15), and 93.1 d 1 (1968Ne02). J ^π : J from atomic beam (1976Fu06); μ close to $\mu(\text{theory}) = +0.07$, supporting assigned configuration.
3 ^b 17	(1) ⁻		C eF E	J ^π : L(d,t)=1 for 1/2 ⁺ target; E(level): from ¹⁶⁹ Tm(γ,n). J ^π : (0 ⁺) suggested in ¹⁶⁹ Tm(γ,n), consistent with population by p _{1/2} and p _{3/2} neutrons; possible configuration: ((ν 7/2[633])-(π 7/2[404])) (1986Ts02).
41 ^b 1 ≈47 [#]	(2) ⁻		C FG AB DE	J ^π : L(d,t)=(3) for 1/2 ⁺ target;
64.31 ^a 5 ≈80 [#]	(4) ⁺		ABC EFG AB E	J ^π : L(d,t)=4 for 1/2 ⁺ target;
112 ^b 1 144.75 ^a 5	(3) ⁻ (5) ⁺		CD F A CD FG	J ^π : L(d,t)=4 for 1/2 ⁺ target; 5 ⁺ consistent with band assignment.
148.45 ^{#g} 5 167 2	(4) ⁺ @ (0) ⁻		AB F C	J ^π : L(d,t)=1 for 1/2 ⁺ target;
178.73 ^b 7 ≈185 [#]	(4) ⁻		A CD FG B	J ^π : L(d,t)=(3) for 1/2 ⁺ target; intraband 138γ to (2 ⁻) 41; band assignment.

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Adopted Levels, Gammas (continued) ^{168}Tm Levels (continued)

E(level) [†]	J ^π [‡]	XREF	Comments
193.28 ^{#h} 6	(4 ⁻) [@]	ab F	
199.2 ^{&} 17	(4 ⁻)	G	
203.65 ^h 10	(3 ⁻)	ab F	
204 [#] 2		A	
229.07 ^{#g} 6	(5 ⁺) [@]	AB F	J ^π : L(d,t)=1 for 1/2 ⁺ target;
230 [#] 1	(1 ⁻)	C	
235 1	(2 ⁻) [@]	C	
241.96 ^a 10	(6 ⁺)	CD FG	J ^π : L(d,t)=6 for 1/2 ⁺ target;
242.1 ^{&}	(5 ⁻)	G	
247.00 ^{#h} 9	(5 ⁻) [@]	AB F	
307.7 ^{&} 13	(6 ⁻)	G	
313 [#] 2	(7 ⁺) [@]	A	Probable configuration=((ν 7/2[633])+(π 7/2[404])) bandhead from (³ He,d) (1973Pr06).
314.06 ^{#h} 9	(6 ⁻) [@]	AB F	
325 2	(3 ⁻)	C	J ^π : L(d,t)=(3) for 1/2 ⁺ target; possible 3 ⁻ member of K ^π =2 ⁻ band; configuration=((ν 5/2[512])±(π 1/2[411])) from (d,t).
327.76 ^{#g} 7	(6 ⁺) [@]	A D F	
337.85 ^{#i} 7	(4 ⁻) [@]	AB F	
347 2	(3 ⁻)	C	J ^π : L(d,t)=3 for 1/2 ⁺ target;
348.96 9		F	J ^π : γ to (5 ⁺) 145 level. Suggested as J=7 member of K ^π =3 ⁺ band in a (d,2nγ) study (1995Si20) but a subsequent (¹¹ B,α3nγ) study (2007CaZW) establishes that band member at E=358 keV.
358.0 ^{#a} 10	(7 ⁺) [@]	CD G	Other E: 352 in (³ He,α) and 353 in (d,t).
366 [#] 2		AB	
383 2	(4 ⁻)	CD	J ^π : L(d,t)=3 for 1/2 ⁺ target.
391.65 ^{#h} 13	(7 ⁻) [@]	AB F	
392.05 ^b 8	(6 ⁻)	FG	
392.8 ^{&} 13	(7 ⁻)	G	
439		C	
442.27 ^g 9	(7 ⁺)	CD F	J ^π : L(d,t)=6 for 1/2 ⁺ target; band assignment.
446.34 ^{#i} 9	(5 ⁻) [@]	AB F	
482 [#]		D	
484.17 ^h 12	(8 ⁻)	F	
493 [#] 2		AB	
493.7 ^a 12	(8 ⁺)	G	
495.8 ^{&} 12	(8 ⁻)	G	
≈499		C	
520 [#] 2		AB	
564.94 ^{#i} 8	(6 ⁻) [@]	AB F	
577.82 ^g 9	(8 ⁺)	A F	XREF: A(580).
592 2	(4 ⁻)	CD	J ^π : L(d,t)=3 for 1/2 ⁺ target. Possible 4 ⁻ member of K ^π =3 ⁻ band; likely configuration=((ν 5/2[512])±(π 1/2[411])) from (³ He,α) and (d,t).
609 [#] 2		AB	
614 ^c 2	(1 ⁻)	C	J ^π : L(d,t)=1 for 1/2 ⁺ target.
620.2 ^{&} 13	(9 ⁻)	G	
631 [#] 2		AB	
638 2	0 ⁻ ,1 ⁻ ,2 ⁻	C	J ^π : L(d,t)=1 for 1/2 ⁺ target.
644.5 ^a 12	(9 ⁺)	G	

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Adopted Levels, Gammas (continued) ^{168}Tm Levels (continued)

E(level) [†]	J ^π [‡]	XREF	Comments
664 ^c 2	(2) ⁻	C	J ^π : L(d,t)=1 for 1/2 ⁺ target.
674 [#] 2		AB	
675.05 ^b 12	(8) ⁻	FG	
698 ^{#i} 2	(7) ⁻ @	AB	
700 2	(2) ⁻	CD	J ^π : L(d,t)=(1+3) for 1/2 ⁺ target. Possible bandhead for a K ^π =2 ⁻ (ν 3/2[521])+(π 1/2[411]) band (1973Ko06).
708 1		C	
717		CD	
726 ^c 2	(3) ⁻	C	J ^π : L(d,t)=3 for 1/2 ⁺ target.
732 [#] 2	(6 ⁺)@	ABC	Probable configuration=((ν 7/2[633])+(π 5/2[402])) bandhead from (³ He,d) (1973Pr06).
744 [#]		D	
755.55 ^h 13	(10) ⁻	F	
759.4 ^{&} 13	(10) ⁻	G	
760 [#] 2		AB	
769 2	(3 ⁺ ,4 ⁺ ,5 ⁺)	C	J ^π : L(d,t)=(4) for 1/2 ⁺ target.
780 3	(2) ⁻	CD	J ^π : L(d,t)=(1+3) for 1/2 ⁺ target.
790 1	0 ⁻ ,1 ⁻ ,2 ⁻	C	J ^π : L(d,t)=1 for 1/2 ⁺ target. Possible 1 ⁻ , (ν 1/2[510])-(π 1/2[411])) state (1973Ko06).
794 1		C	
798 1		CD	
816.9 ^a 13	(10 ⁺)	G	
818 ^{#m} 3	(1 ⁺)@	ABC	J ^π : L(d,t)=(2) for 1/2 ⁺ target.
836 4	0 ⁻ ,1 ⁻ ,2 ⁻	C	J ^π : L(d,t)=1 for 1/2 ⁺ target.
847 ^{#m} 2	(2 ⁺)@	AB	
849 [#] 2		CD	J ^π : L(d,t)=3 on 1/2 ⁺ target for 849 or 859 level. The 853 1 or 859 1 level in (d,t) may be a 2 ⁻ , (ν 1/2[510])-(π 1/2[411])) state (1973Ko06).
859 1		C	J ^π : see comments on 849 level.
866 1		C	
887 1	0 ⁻ ,1 ⁻ ,2 ⁻	C	J ^π : L(d,t)=1 for 1/2 ⁺ target. Possible 2 ⁻ , (ν 1/2[510])+(π 1/2[411])) state (1973Ko06).
890 ^m 2	(3 ⁺)@	AB	
897 1	-	CD	J ^π : One member of 902-keV doublet in 1973Ko06 is possibly the bandhead of a K ^π =2 ⁻ (ν 5/2[523])-(π 1/2[411]) band, with higher members at 951, 1052, and 1162. 1973Ko06 report L=(1&3) for the doublet.
905 1	-	C	See comment with 897 level.
915	-	CD	One member of 918-keV doublet in 1973Ko06 is possibly the 4 ⁻ member of a K ^π =2 ⁻ (ν 3/2[521])+(π 1/2[411]) band with bandhead at 700 keV. 1973Ko06 report L=(3&5) for the doublet.
921 1	-	CD	See comment with 915 level.
925.6 ^{&} 13	(11) ⁻	G	
937 [#] 1	2 ⁻ ,3 ⁻ ,4 ⁻	ABC	E(level): from (d,t). J ^π : L(d,t)=3 for 1/2 ⁺ target.
945		C	
953 1	(3) ⁻	Cd	J ^π : L(d,t)=3 for 1/2 ⁺ target.
966 3	(4) ⁻	BCd	J ^π : L(d,t)=(3+5) for 1/2 ⁺ target.
974 [#] 3		D	
985 2	2 ⁻ ,3 ⁻ ,4 ⁻	C	J ^π : L(d,t)=3 for 1/2 ⁺ target.
993 [#] 2		A C	
1001 [#] 2		B	
1008.5 ^a 14	(11 ⁺)	G	
1009 [#] 2		A	
1019 6	(2 ⁻ ,3 ⁻ ,4 ⁻)	C	J ^π : L(d,t)=(3) for 1/2 ⁺ target.

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Adopted Levels, Gammas (continued) ^{168}Tm Levels (continued)

E(level) [†]	J ^π [‡]	XREF	Comments
1020.3 ^b 10	(10 ⁻)	G	
1041 1	2 ⁻ , 3 ⁻ , 4 ⁻	Cd	J ^π : L(d,t)=3 for 1/2 ⁺ target.
1052	(4 ⁻)	Cd	J ^π : L(d,t)=3 for 1/2 ⁺ target; band assignment.
1056 2	(0 ⁺) [@]	C	
1061 [#] 2		CD	
1077 5	(2 ⁻ , 3 ⁻ , 4 ⁻)	C	J ^π : L(d,t)=(3) for 1/2 ⁺ target.
1097.25 ^h 17	(12 ⁻)	F	
1098 2	(5 ⁻)	CD	J ^π : L(d,t)=(5) for 1/2 ⁺ target; band assignment.
1098.8 ^{&} 14	(12 ⁻)	G	
1115 ^d 2	(2 ⁺)	C	J ^π : L(d,t)=2 for 1/2 ⁺ target; band assignment.
1127 2	(1 ⁺)	AbCd	J ^π : L(d,t)=0 for 1/2 ⁺ target; band assignment.
1133 1	(2 ⁺) [@]	bCd	
1162 [#] 2	(5 ⁻)	ABC	J ^π : L(d,t)=(5) for 1/2 ⁺ target; band assignment.
1170 [#] 3		D	
1182 ^d 2	(3 ⁺)	C	J ^π : L(d,t)=(2) for 1/2 ⁺ target; band assignment.
1187 [#]		D	
1194 2	(1 ⁺ , 2 ⁺ , 3 ⁺)	C	J ^π : L(d,t)=(2) for 1/2 ⁺ target.
≈1202 [#]		A	
1212.3 ^a 15	(12 ⁺)	G	
≈1225 [#]		A	
1240 2	(3 ⁺)	C	J ^π : L(d,t)=2 for 1/2 ⁺ target; band assignment.
≈1252 [#]		A	
1260 2	1 ⁺ , 2 ⁺ , 3 ⁺	CD	J ^π : L(d,t)=2 for 1/2 ⁺ target.
1268 1		a C	
1276 2	1 ⁺ , 2 ⁺ , 3 ⁺	a C	J ^π : L(d,t)=2 for 1/2 ⁺ target.
1281 1		C	
1302 2	(1 ⁺ , 2 ⁺ , 3 ⁺)	C	J ^π : L(d,t)=(2) for 1/2 ⁺ target.
1310.4 ^{&} 15	(13 ⁻)	G	
1311 2	0 ⁺ , 1 ⁺	C	J ^π : L(d,t)=0 for 1/2 ⁺ target.
1322 [#] 2		AB	
1330 2	(2 ⁻ , 3 ⁻ , 4 ⁻)	C	J ^π : L(d,t)=(3) for 1/2 ⁺ target.
1343 [#] 2		AB d	
1347 ^e 2	(1 ⁺)	Cd	J ^π : L(d,t)=0 for 1/2 ⁺ target; band assignment.
1356 1		C	
1362 2	(1 ⁺ , 2 ⁺ , 3 ⁺)	C	J ^π : L(d,t)=(2) for 1/2 ⁺ target.
1378 ^e 3	(2 ⁺)	C	J ^π : L(d,t)=(2) for 1/2 ⁺ target; band assignment.
1389 ^{#n} 2	(4 ⁻) [@]	AB	
1390 6	(0 ⁻ , 1 ⁻ , 2 ⁻)	C	J ^π : L(d,t)=(1) for 1/2 ⁺ target.
1407 4	0 ⁺ , 1 ⁺	C	J ^π : L(d,t)=0 for 1/2 ⁺ target.
1414 [#] 2		AB D	
1420.9 ^b 15	(12 ⁻)	G	
1426 ^f 2	(1 ⁺)	C	J ^π : L(d,t)=0 for 1/2 ⁺ target; band assignment.
1434 ^o 2	(3 ⁻) [@]	ABCD	
1445 2	0 ⁺ , 1 ⁺	C	J ^π : L(d,t)=0 for 1/2 ⁺ target.
1451.0 ^a 17	(13 ⁺)	G	
1454 [#]		D	
≈1460 [#]		AB	
1465 2	(⁺)	CD	J ^π : L(d,t)=0 for 1/2 ⁺ target. However, 1973Pr06 assign 3 ⁺ (configuration=((ν 3/2[402])-(π 1/2[411]))) in (d,t), inconsistent with L=0.

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Adopted Levels, Gammas (continued) ^{168}Tm Levels (continued)

E(level) [†]	J ^π [‡]	XREF	Comments
1472 <i>I</i>		C	
1482 <i>#n</i> 2	(5 ⁻) [@]	AB	
1484 <i>f</i> 5	(2 ⁺)	C	J ^π : L(d,t)=(2) for 1/2 ⁺ target; band assignment.
1501 <i>#</i> 2		AB	
1506 2	(⁺)	C	J ^π : L(d,t)=0 for 1/2 ⁺ target. However, 1973Pr06 assign 2 ⁺ (configuration=((ν 3/2[402])-(π 1/2[411]))) in (d,t), inconsistent with L=0.
1514.6 <i>&</i> 16	(14 ⁻)	G	
1520		C	
1540 <i>#o</i> 2	(4 ⁻) [@]	AB	
1554		C	
1563 <i>#</i> 2		AB d	
1568		Cd	
1590 <i>#n</i> 2	(6 ⁻) [@]	AB	
1604		C	
1621		CD	
1628 <i>#o</i> 2	(5 ⁻) [@]	A	
1637		C	
1662 <i>I</i>		C	
1677.9 <i>a</i> 18	(14 ⁺)	G	
1690		CD	
1742		C	
1775.0 <i>&</i> 16	(15 ⁻)	G	
1802 <i>#</i>		D	
1872.6 <i>b</i> 18	(14 ⁻)	G	
1905 <i>#</i>		D	
1967.9 <i>a</i> 20	(15 ⁺)	G	
2007.1 <i>&</i> 17	(16 ⁻)	G	
2212.3 <i>a</i> 21	(16 ⁺)	G	
2318.4 <i>&</i> 18	(17 ⁻)	G	
2375.9 <i>b</i> 20	(16 ⁻)	G	
2548.2 <i>a</i> 22	(17 ⁺)	G	
2575.1 <i>&</i> 18	(18 ⁻)	G	
2812.7 <i>a</i> 23	(18 ⁺)	G	
2933.7 <i>b</i> 23	(18 ⁻)	G	
2936.6 <i>&</i> 20	(19 ⁻)	G	
3186.3 <i>a</i> 25	(19 ⁺)	G	
3217.1 <i>&</i> 21	(20 ⁻)	G	
3475.6 <i>a</i> 25	(20 ⁺)	G	
3547.9 <i>b</i> 25	(20 ⁻)	G	
3625.5 <i>&</i> 23	(21 ⁻)	G	
3881 <i>a</i> 3	(21 ⁺)	G	
3929.4 <i>&</i> 23	(22 ⁻)	G	
4190 <i>a</i> 3	(22 ⁺)	G	
4220 <i>b</i> 3	(22 ⁻)	G	
4379.8 <i>&</i> 25	(23 ⁻)	G	
4705.2 <i>&</i> 25	(24 ⁻)	G	
4951 <i>b</i> 3	(24 ⁻)	G	

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Adopted Levels, Gammas (continued) ^{168}Tm Levels (continued)

E(level) [†]	J ^π [‡]	XREF	E(level) [†]	J ^π [‡]	XREF	E(level) [†]	J ^π [‡]	XREF
0.0+x ^j	(2 ⁺)	G	2517+x ^k 3		G	1595.4+y ^l 17	(15 ⁻)	G
121.2+x ^j 10	(4 ⁺)	G	3095+x ^k 3		G	1857.3+y ^l 18	(16 ⁻)	G
291.8+x ^j 15	(5 ⁺)	G	3733+x ^k 3		G	2140.9+y ^l 19	(17 ⁻)	G
315.1+x ^j 15	(6 ⁺)	G	0.0+y [#]	(7 ⁺)	G	2434.6+y ^l 19	(18 ⁻)	G
508.7+x ^j 17	(7 ⁺)	G	182.6+y ^l 10	(7 ⁻)	G	2757.0+y ^l 21	(19 ⁻)	G
582.5+x ^j 17	(8 ⁺)	G	292.9+y ^l 13	(8 ⁻)	G	3076.1+y ^l 22	(20 ⁻)	G
795.8+x ^j 17	(9 ⁺)	G	420.9+y ^l 13	(9 ⁻)	G	3437.2+y ^l 23	(21 ⁻)	G
922.4+x ^j 18	(10 ⁺)	G	567.5+y ^l 14	(10 ⁻)	G	3772.9+y ^l 24	(22 ⁻)	G
1143.4+x ^j 19	(11 ⁺)	G	733.6+y ^l 15	(11 ⁻)	G	4170+y ^l 3	(23 ⁻)	G
1333.1+x ^j 21	(12 ⁺)	G	919.5+y ^l 15	(12 ⁻)	G	4518+y ^l 3	(24 ⁻)	G
1539.2+x ^k 21		G	1125.2+y ^l 16	(13 ⁻)	G			
1996.8+x ^k 24		G	1350.4+y ^l 17	(14 ⁻)	G			

[†] From least-squares fit to E_γ for levels whose γ deexcitation has been observed, assigning ΔE=1 keV to E_γ data for which the authors reported no uncertainty. Average energy from cross-referenced source datasets otherwise.

[‡] Values given without comment are based on band structure deduced in ($^{11}\text{B}, \alpha 3n\gamma$) or ($d, 2n\gamma$), except as noted.

Average from $^{167}\text{Er}(^3\text{He}, d)$, $^{167}\text{Er}(\alpha, t)$, $^{169}\text{Tm}(d, t)$, and/or $^{169}\text{Tm}(^3\text{He}, \alpha)$.

@ From comparison of experimental cross section patterns in stripping and pickup reactions with characteristic calculated spectra (fingerprints), and/or other model arguments (1973Pr06).

& Band(A): ($\nu i_{13/2} \otimes (\pi h_{9/2})$) band (2007CaZW). $J^\pi=(4^-)$ for lowest-energy level observed.

^a Band(B): $K^\pi=3^+$ g.s. band (2007CaZW). A=8.0 (J=3, 4, 5 levels). Configuration=(($\nu 7/2[633]$)-($\pi 1/2[411]$)).

^b Band(C): $K^\pi=1^-$ band (2007CaZW). A=11.0 (J=1, 2, 3 levels). Configuration=(($\nu 1/2[521]$)+($\pi 1/2[411]$)). γ-ray placements within this band are tentative (1995Si20).

^c Band(D): $K^\pi=1^-$ band. A=12.5 (J=1, 2 levels). Configuration=(($\nu 3/2[521]$)-($\pi 1/2[411]$)) (1973Ko06).

^d Band(E): $K^\pi=2^+$ band. Configuration=(($\nu 3/2[402]$)+($\pi 1/2[411]$)) (1973Pr06).

^e Band(F): $K^\pi=1^+$ band. Configuration=(($\nu 1/2[400]$)+($\pi 1/2[411]$)) (1973Pr06).

^f Band(G): $K^\pi=1^+$ band. Configuration=(($\nu 3/2[402]$)-($\pi 1/2[411]$)) (1973Pr06).

^g Band(H): $K^\pi=(4^+)$ ($\nu 7/2[633]$)+($\pi 1/2[411]$) band (1995Si20).

^h Band(I): $K^\pi=(3^-)$ ($\nu 7/2[633]$)-($\pi 1/2[541]$) band (1995Si20).

ⁱ Band(J): $K^\pi=(4^-)$ ($\nu 7/2[633]$)+($\pi 1/2[541]$) band (1973Pr06).

^j Band(K): ($\nu 7/2[633]$) $\otimes$ ($\pi 7/2[404]$) band (2007CaZW). $J^\pi=(2^+)$ for lowest-energy level observed.

^k Band(L): sideband (2007CaZW).

^l Band(M): ($\nu i_{13/2} \otimes (\pi 7/2[523])$) band (2007CaZW). $J^\pi=(7^-)$ for lowest-energy level observed.

^m Band(N): $K^\pi=(1^+)$ ($\nu 7/2[633]$)-($\pi 5/2[402]$) band (1973Pr06).

ⁿ Band(O): $K^\pi=(4^-)$ ($\nu 7/2[633]$)+($\pi 1/2[530]$) band (1973Pr06).

^o Band(P): $K^\pi=(3^-)$ ($\nu 7/2[633]$)-($\pi 1/2[530]$) band (1973Pr06).

 $\gamma(^{168}\text{Tm})$

E _i (level)	J _i ^π	E _γ [†]	I _γ [†]	E _f	J _f ^π	Mult.	α [#]	Comments
64.31	(4) ⁺	64.37 5	100	0.0	3 ⁺	[M1,E2]	15 4	
112	(3 ⁻)	109.16 [@] 19	100	3	(1) ⁻	[E2]	2.20 4	
144.75	(5) ⁺	80.53 6	100 9	64.31	(4) ⁺	[M1,E2]	6.5 7	I _γ : γ is doubly-placed; however, γγ coin data in (d,2nγ) indicate that most of the intensity belongs with this placement.
		144.74 8	≈42	0.0	3 ⁺	[E2]	0.790	I _γ : a small fraction of this intensity belongs with the 145γ that deexcites the 392 level.

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Adopted Levels, Gammas (continued)

$\gamma(^{168}\text{Tm})$ (continued)								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult.	$\alpha^\#$	Comments
148.45	(4 ⁺)	148.39 7	100	0.0	3 ⁺	[M1,E2]	0.87 15	I_γ : see comment on 80.53 γ from 145 level.
178.73	(4 ⁻)	137.73 7	100	41	(2 ⁻)	[E2]	0.943	
193.28	(4 ⁻)	193.29 6	100	0.0	3 ⁺	[E1]	0.0587	
203.65	(3 ⁻)	139.34 9	100	64.31	(4 ⁺)	[E1]	0.1387	
229.07	(5 ⁺)	80.53 6		148.45	(4 ⁺)	[M1,E2]	6.5 7	
		84.42 6	100	144.75	(5 ⁺)			
241.96	(6 ⁺)	97.09	16.7 19	144.75	(5 ⁺)	[M1,E2]	3.41 6	
		177.65 9	100 9	64.31	(4 ⁺)	[E2]	0.388	
247.00	(5 ⁻)	182.69 10	100	64.31	(4 ⁺)	[E1]	0.0680	
307.7	(6 ⁻)	65.0 $\ddagger$		242.1	(5 ⁻)			
		108.5 $\ddagger$		199.2	(4 ⁻)			
314.06	(6 ⁻)	67.06 6	67 10	247.00	(5 ⁻)	[M1,E2]	12 3	
		120.82 12	100 10	193.28	(4 ⁻)	[E2]	1.514	
		169.2 2	9.5 10	144.75	(5 ⁺)	[E1]	0.0831	
327.76	(6 ⁺)	98.69 6	100 10	229.07	(5 ⁺)	[M1,E2]	3.22	
		179.31 8	56 7	148.45	(4 ⁺)	[E2]	0.376	
337.85	(4 ⁻)	189.46 6	58 8	148.45	(4 ⁺)	[E1]	0.0618	
		337.7 1	100 8	0.0	3 ⁺			
348.96		204.21 7	100	144.75	(5 ⁺)			
358.0	(7 ⁺)	114.6 $\ddagger$		241.96	(6 ⁺)			
		213.3 $\ddagger$		144.75	(5 ⁺)			
391.65	(7 ⁻)	144.74 [@] 8		247.00	(5 ⁻)	[E2]	0.790	
		149.69 8	100 13	241.96	(6 ⁺)	[E1]	0.1147	
392.05	(6 ⁻)	213.32 3	100	178.73	(4 ⁻)	[E2]	0.210	
392.8	(7 ⁻)	85.2 $\ddagger$		307.7	(6 ⁻)			
		149.4 $\ddagger$		242.1	(5 ⁻)			
442.27	(7 ⁺)	114.45 5	100 13	327.76	(6 ⁺)	[M1,E2]	1.98 14	
		213.32 [@] 1		229.07	(5 ⁺)	[E2]	0.210	
446.34	(5 ⁻)	217.27 6	100	229.07	(5 ⁺)			
484.17	(8 ⁻)	170.11 8	100	314.06	(6 ⁻)	[E2]	0.450	
493.7	(8 ⁺)	135.7 $\ddagger$		358.0	(7 ⁺)			
		250.4 $\ddagger$		241.96	(6 ⁺)			
495.8	(8 ⁻)	103.1 $\ddagger$		392.8	(7 ⁻)			
		137.5 $\ddagger$		358.0	(7 ⁺)			
		188.4 $\ddagger$		307.7	(6 ⁻)			
564.94	(6 ⁻)	227.09 5	100	337.85	(4 ⁻)			
577.82	(8 ⁺)	135.49 [@] 5	<64	442.27	(7 ⁺)	[M1,E2]	1.15 16	
		250.17 [@] 7	100 9	327.76	(6 ⁺)			
620.2	(9 ⁻)	124.3 $\ddagger$		495.8	(8 ⁻)			
		126.3 $\ddagger$		493.7	(8 ⁺)			
		227.4 $\ddagger$		392.8	(7 ⁻)			
644.5	(9 ⁺)	150.7 $\ddagger$		493.7	(8 ⁺)			
		286.5 $\ddagger$		358.0	(7 ⁺)			
675.05?	(8 ⁻)	283.00 [@] 9	100	392.05	(6 ⁻)			
755.55	(10 ⁻)	271.38 5	100	484.17	(8 ⁻)			
759.4	(10 ⁻)	115.1 $\ddagger$		644.5	(9 ⁺)			
		139.1 $\ddagger$		620.2	(9 ⁻)			
		263.7 $\ddagger$		495.8	(8 ⁻)			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{168}\text{Tm})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π
816.9	(10 ⁺)	172.4 †		644.5	(9 ⁺)	4220	(22 ⁻)	672.3 †	100	3547.9	(20 ⁻)
		323.3 †		493.7	(8 ⁺)	4379.8	(23 ⁻)	754.3 †	100	3625.5	(21 ⁻)
925.6	(11 ⁻)	108.5 †		816.9	(10 ⁺)	4705.2	(24 ⁻)	775.8 †	100	3929.4	(22 ⁻)
		166.3 †		759.4	(10 ⁻)	4951	(24 ⁻)	730.8 †	100	4220	(22 ⁻)
		305.4 †		620.2	(9 ⁻)	121.2+x	(4 ⁺)	121.2 †	100	0.0+x	(2 ⁺)
1008.5	(11 ⁺)	191.7		816.9	(10 ⁺)	291.8+x	(5 ⁺)	170.6 †	100	121.2+x	(4 ⁺)
		363.7		644.5	(9 ⁺)	315.1+x	(6 ⁺)	193.9 †	100	121.2+x	(4 ⁺)
1020.3	(10 ⁻)	345.2 †		675.05?	(8 ⁻)	508.7+x	(7 ⁺)	193.4 †	100	315.1+x	(6 ⁺)
1097.25	(12 ⁻)	341.7 I	100	755.55	(10 ⁻)	582.5+x	(8 ⁺)	73.7 †		508.7+x	(7 ⁺)
1098.8	(12 ⁻)	173.2 †		925.6	(11 ⁻)			267.6 †		315.1+x	(6 ⁺)
		339.4 †		759.4	(10 ⁻)	795.8+x	(9 ⁺)	213.2 †		582.5+x	(8 ⁺)
1212.3	(12 ⁺)	203.6 †		1008.5	(11 ⁺)			287.1 †		508.7+x	(7 ⁺)
		395.5 †		816.9	(10 ⁺)	922.4+x	(10 ⁺)	126.7 †		795.8+x	(9 ⁺)
1310.4	(13 ⁻)	211.6 †		1098.8	(12 ⁻)			340.0 †		582.5+x	(8 ⁺)
		384.7 †		925.6	(11 ⁻)	1143.4+x	(11 ⁺)	221.1 †		922.4+x	(10 ⁺)
1420.9	(12 ⁻)	400.6 †	100	1020.3	(10 ⁻)			347.5 †		795.8+x	(9 ⁺)
1451.0	(13 ⁺)	442.5 †	100	1008.5	(11 ⁺)	1333.1+x	(12 ⁺)	410.7 †	100	922.4+x	(10 ⁺)
1514.6	(14 ⁻)	204.2 †		1310.4	(13 ⁻)	1539.2+x		395.8 †	100	1143.4+x	(11 ⁺)
		415.9 †		1098.8	(12 ⁻)	1996.8+x		457.6 †	100	1539.2+x	
1677.9	(14 ⁺)	465.6 †	100	1212.3	(12 ⁺)	2517+x		519.8 †	100	1996.8+x	
1775.0	(15 ⁻)	260.5 †		1514.6	(14 ⁻)	3095+x		578.7 †	100	2517+x	
		464.6 †		1310.4	(13 ⁻)	3733+x		637.7 †	100	3095+x	
1872.6	(14 ⁻)	451.7 †	100	1420.9	(12 ⁻)	182.6+y	(7 ⁻)	182.6 †	100	0.0+y	(7 ⁺)
1967.9	(15 ⁺)	516.9 †	100	1451.0	(13 ⁺)	292.9+y	(8 ⁻)	110.2 †	100	182.6+y	(7 ⁻)
2007.1	(16 ⁻)	232.1 †		1775.0	(15 ⁻)	420.9+y	(9 ⁻)	127.8 †		292.9+y	(8 ⁻)
		492.5 †		1514.6	(14 ⁻)			238.4 †		182.6+y	(7 ⁻)
2212.3	(16 ⁺)	534.4 †	100	1677.9	(14 ⁺)	567.5+y	(10 ⁻)	146.6 †		420.9+y	(9 ⁻)
2318.4	(17 ⁻)	311.3 †		2007.1	(16 ⁻)			274.6 †		292.9+y	(8 ⁻)
		543.3 †		1775.0	(15 ⁻)	733.6+y	(11 ⁻)	166.1 †		567.5+y	(10 ⁻)
2375.9	(16 ⁻)	503.3 †	100	1872.6	(14 ⁻)			312.7 †		420.9+y	(9 ⁻)
2548.2	(17 ⁺)	580.3 †	100	1967.9	(15 ⁺)	919.5+y	(12 ⁻)	185.9 †		733.6+y	(11 ⁻)
2575.1	(18 ⁻)	256.7 †		2318.4	(17 ⁻)			351.9 †		567.5+y	(10 ⁻)
		568.0 †		2007.1	(16 ⁻)	1125.2+y	(13 ⁻)	205.8 †		919.5+y	(12 ⁻)
2812.7	(18 ⁺)	600.4 †	100	2212.3	(16 ⁺)			391.7 †		733.6+y	(11 ⁻)
2933.7	(18 ⁻)	557.8 †	100	2375.9	(16 ⁻)	1350.4+y	(14 ⁻)	225.2 †		1125.2+y	(13 ⁻)
2936.6	(19 ⁻)	618.2 †	100	2318.4	(17 ⁻)			430.8 †		919.5+y	(12 ⁻)
3186.3	(19 ⁺)	638.1 †	100	2548.2	(17 ⁺)	1595.4+y	(15 ⁻)	245.0 †		1350.4+y	(14 ⁻)
3217.1	(20 ⁻)	642.0 †	100	2575.1	(18 ⁻)			470.2 †		1125.2+y	(13 ⁻)
3475.6	(20 ⁺)	662.9 †	100	2812.7	(18 ⁺)	1857.3+y	(16 ⁻)	262.0 †		1595.4+y	(15 ⁻)
3547.9	(20 ⁻)	614.2 †	100	2933.7	(18 ⁻)			506.9 †		1350.4+y	(14 ⁻)
3625.5	(21 ⁻)	688.9 †	100	2936.6	(19 ⁻)	2140.9+y	(17 ⁻)	283.5 †		1857.3+y	(16 ⁻)
3881	(21 ⁺)	695.1 †	100	3186.3	(19 ⁺)			545.4 †		1595.4+y	(15 ⁻)
3929.4	(22 ⁻)	712.3 †	100	3217.1	(20 ⁻)	2434.6+y	(18 ⁻)	293.6 †		2140.9+y	(17 ⁻)
4190?	(22 ⁺)	714 †	100	3475.6	(20 ⁺)			577.5 †		1857.3+y	(16 ⁻)

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{168}\text{Tm})$ (continued)

<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>$E_\gamma^\dagger$</u>	<u>$I_\gamma^\dagger$</u>	<u>E_f</u>	<u>J_f^π</u>
2757.0+y	(19 ⁻)	616.1 [‡]	100	2140.9+y	(17 ⁻)
3076.1+y	(20 ⁻)	641.5 [‡]	100	2434.6+y	(18 ⁻)
3437.2+y	(21 ⁻)	680.2 [‡]	100	2757.0+y	(19 ⁻)
3772.9+y	(22 ⁻)	696.8 [‡]	100	3076.1+y	(20 ⁻)
4170+y?	(23 ⁻)	733 [‡]	100	3437.2+y	(21 ⁻)
4518+y?	(24 ⁻)	745	100	3772.9+y	(22 ⁻)

[†] From $^{168}\text{Er}(d,2n\gamma)$, except as noted.

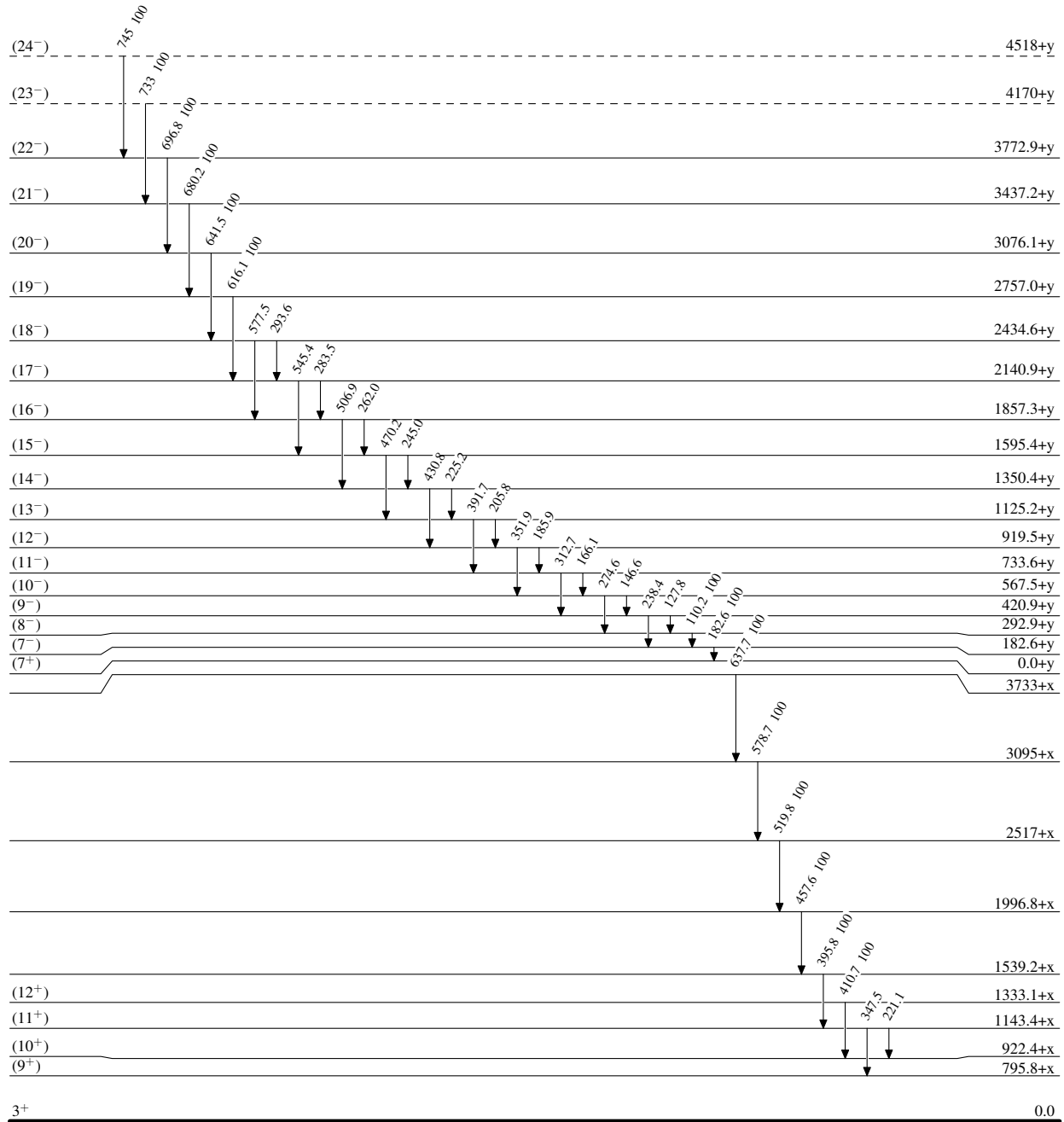
[‡] From $^{164}\text{Dy}(^{11}\text{B},\alpha 3n\gamma)$; uncertainty unstated by authors.

Total theoretical internal conversion coefficients, calculated using the BrIcc code ([2008Ki07](#)) with Frozen orbital approximation based on γ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

@ Placement of transition in the level scheme is uncertain.

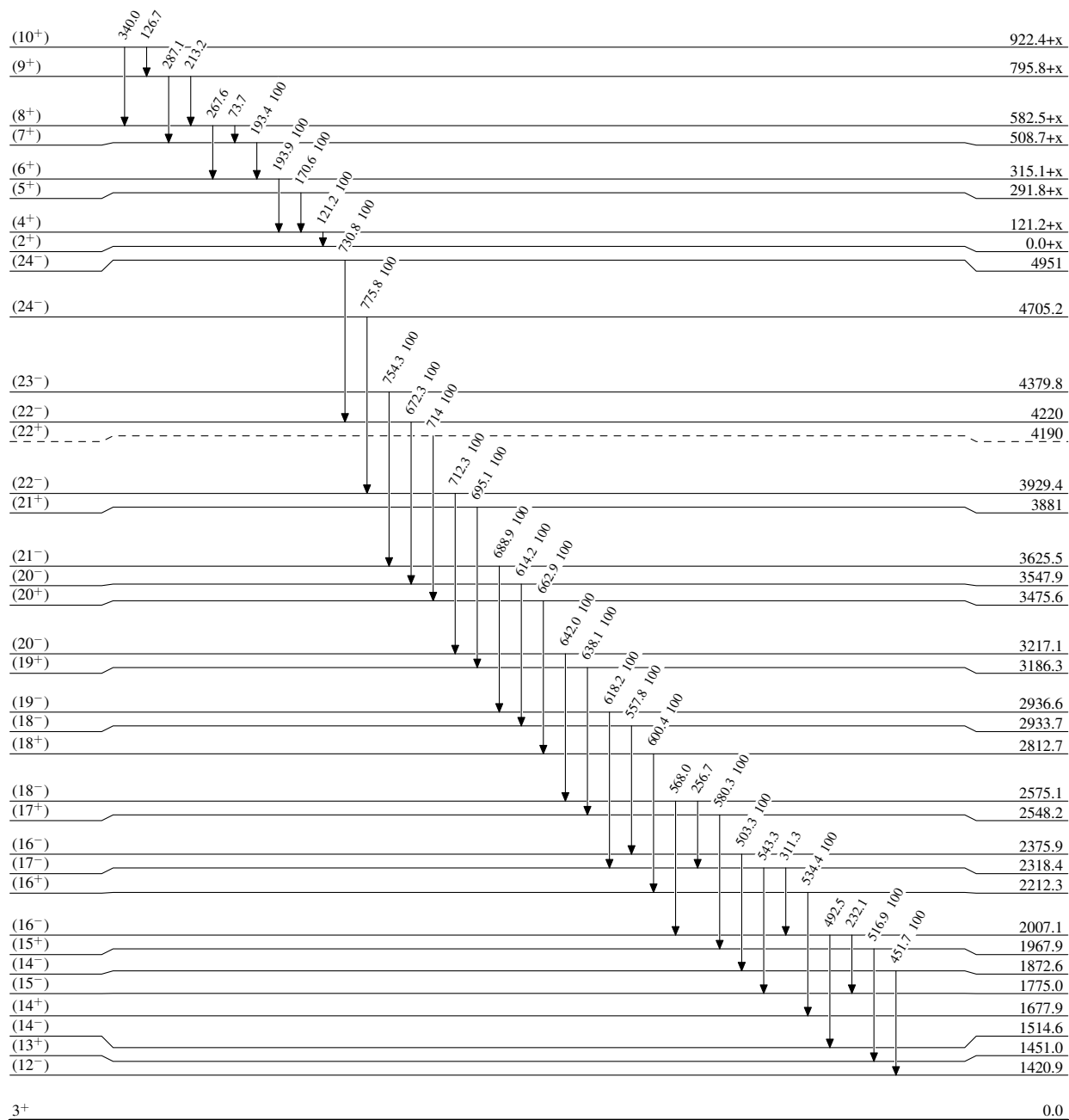
Adopted Levels, Gammas**Level Scheme**

Intensities: Relative photon branching from each level



Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level



3+

0.0

93.1 d 2

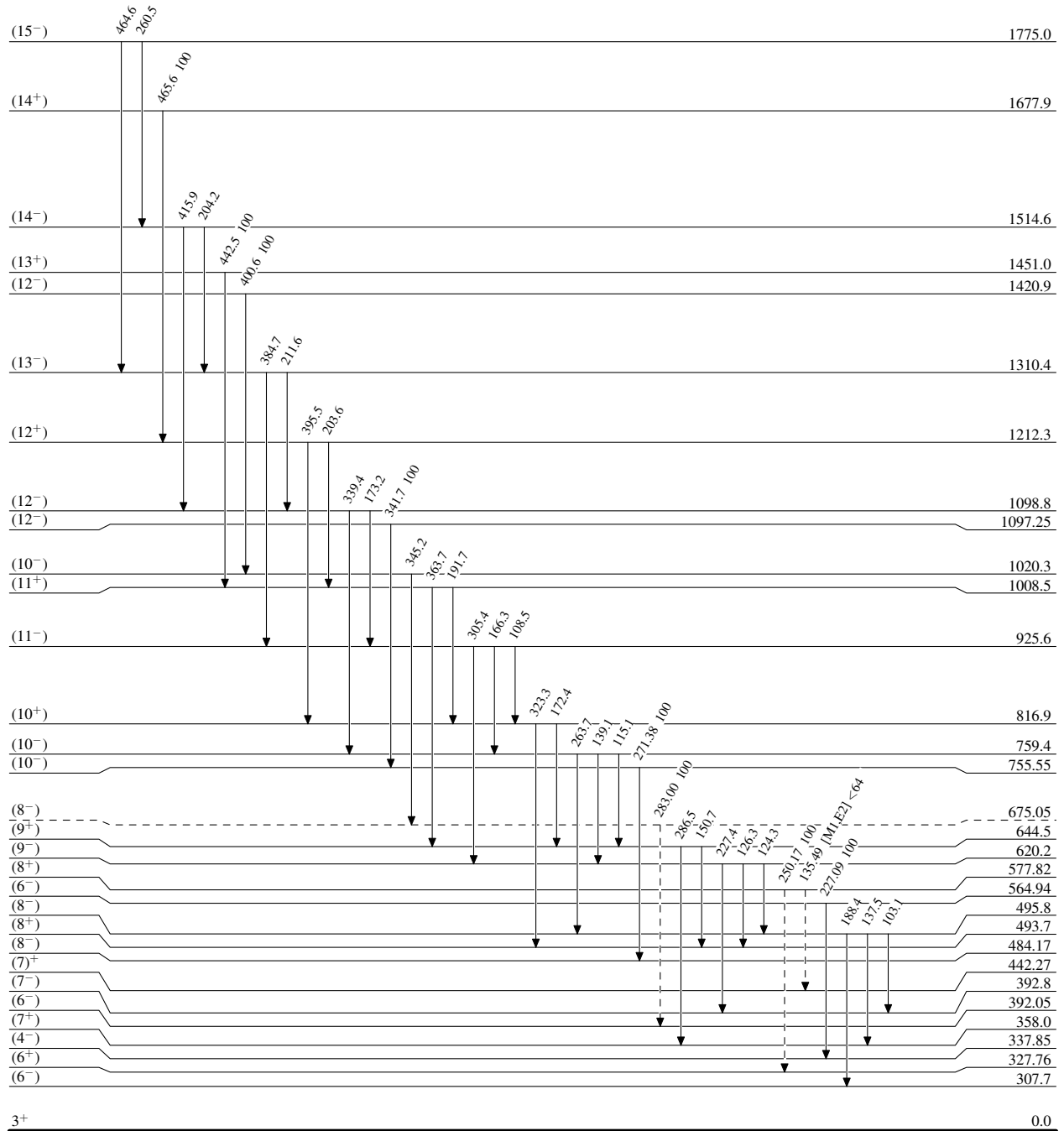
 $^{168}_{69}\text{Tm}_{99}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

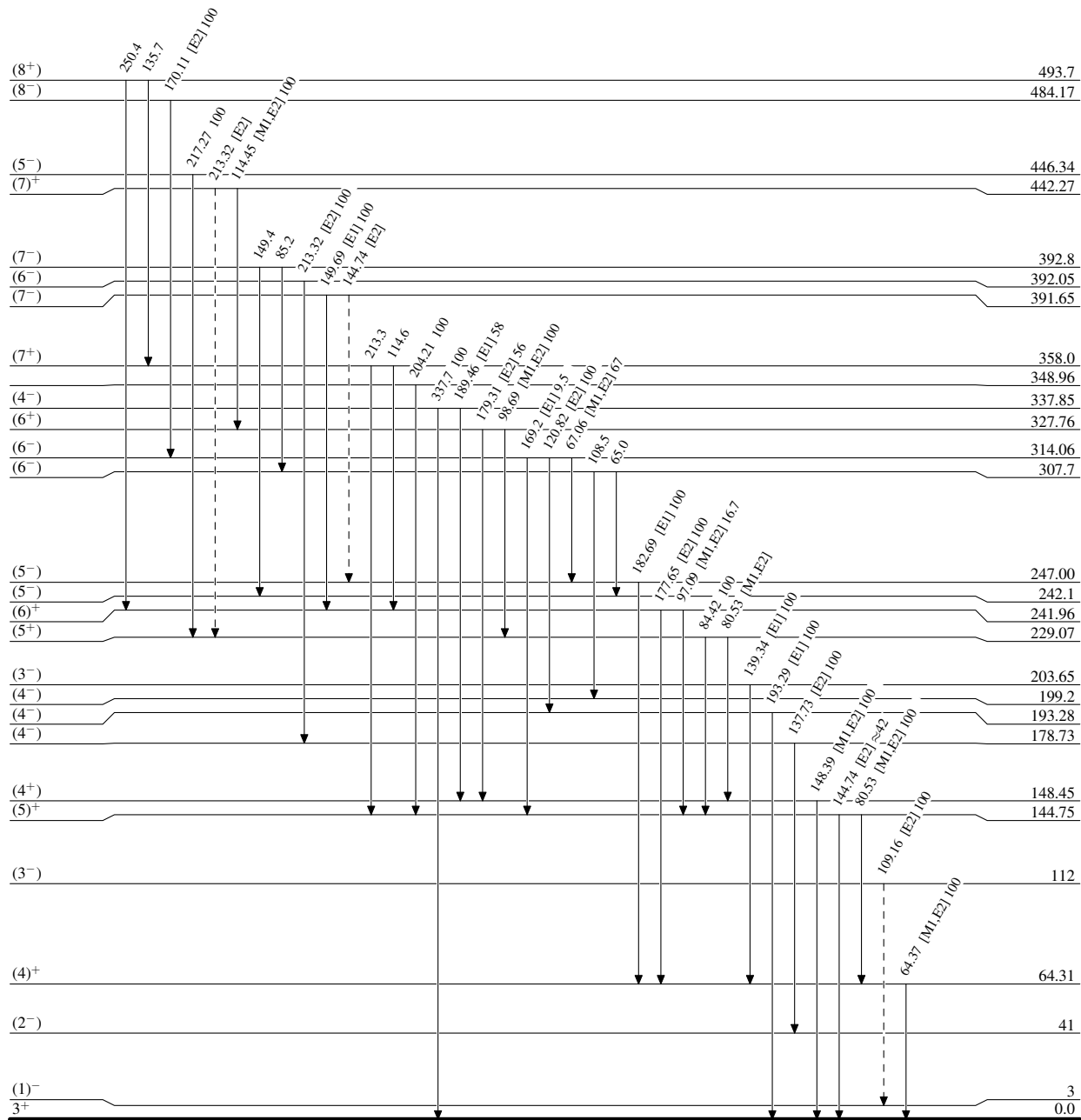
-----► γ Decay (Uncertain)


Adopted Levels, Gammas

Legend

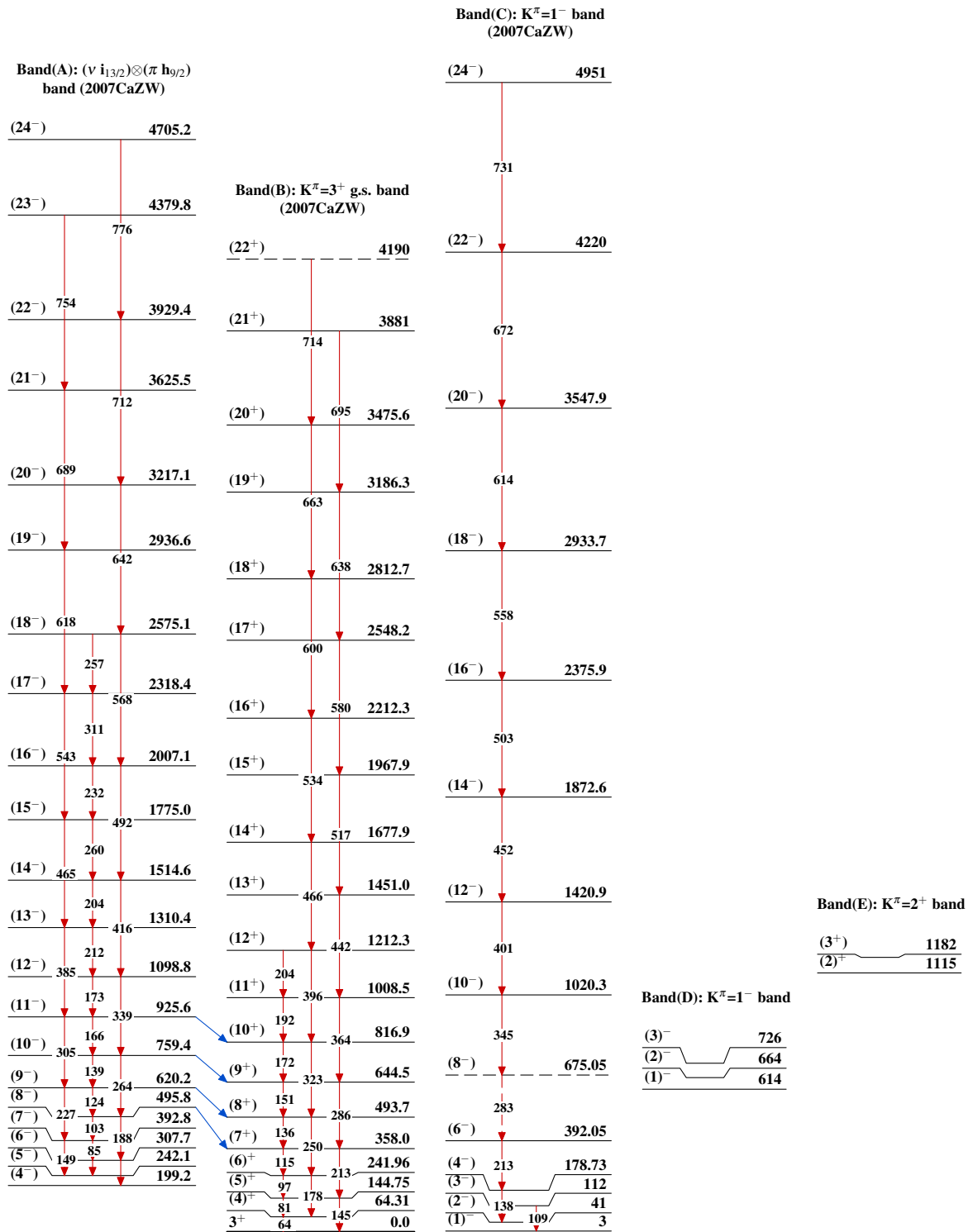
Level Scheme (continued)

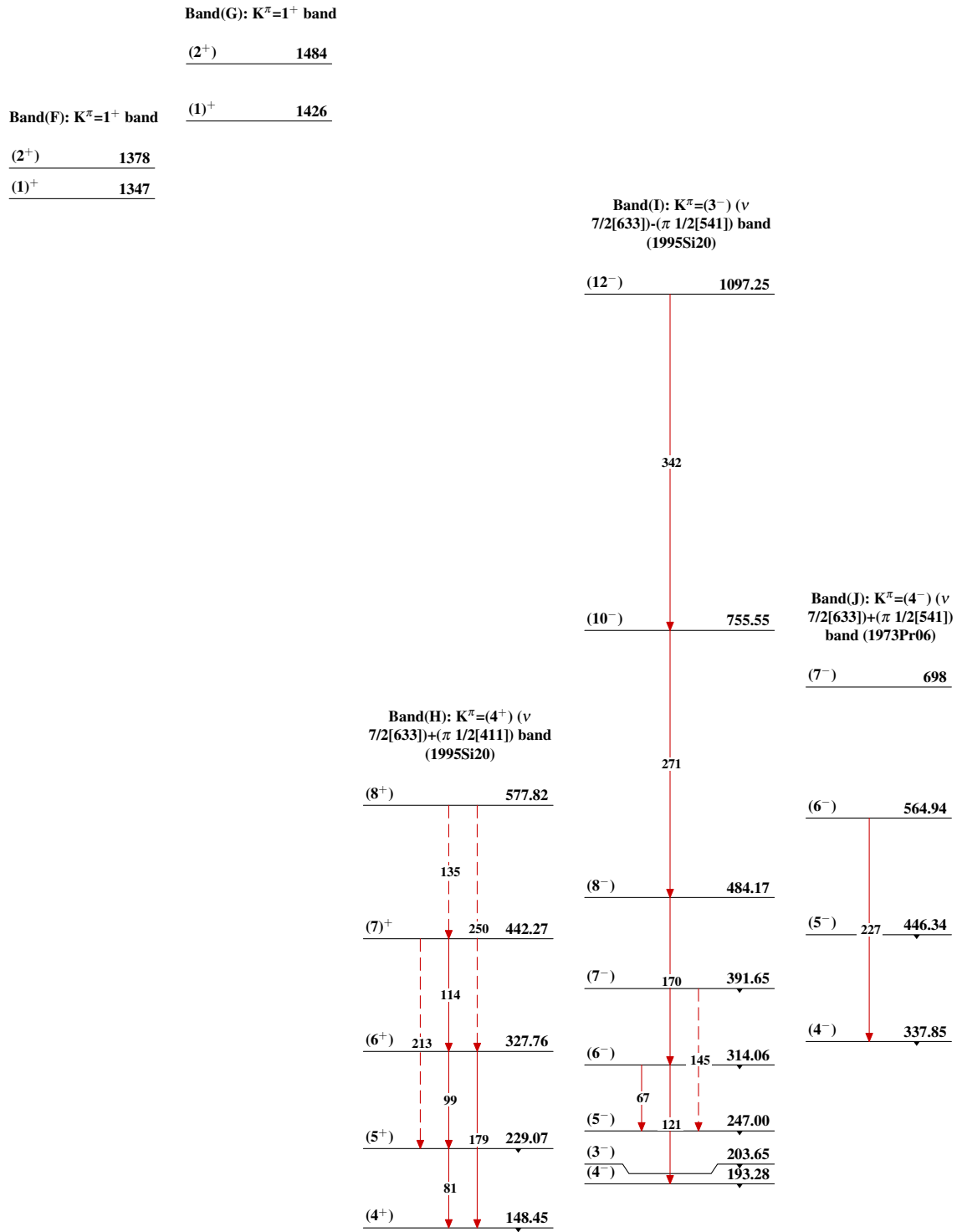
Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)


93.1 d 2

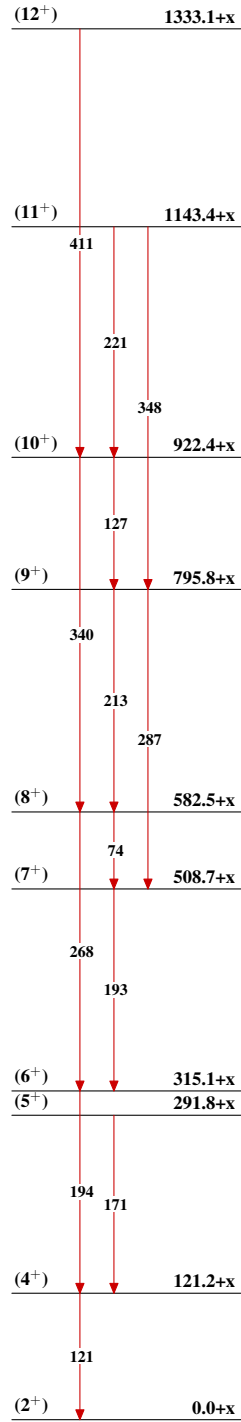
 $^{168}_{69}\text{Tm}_{99}$

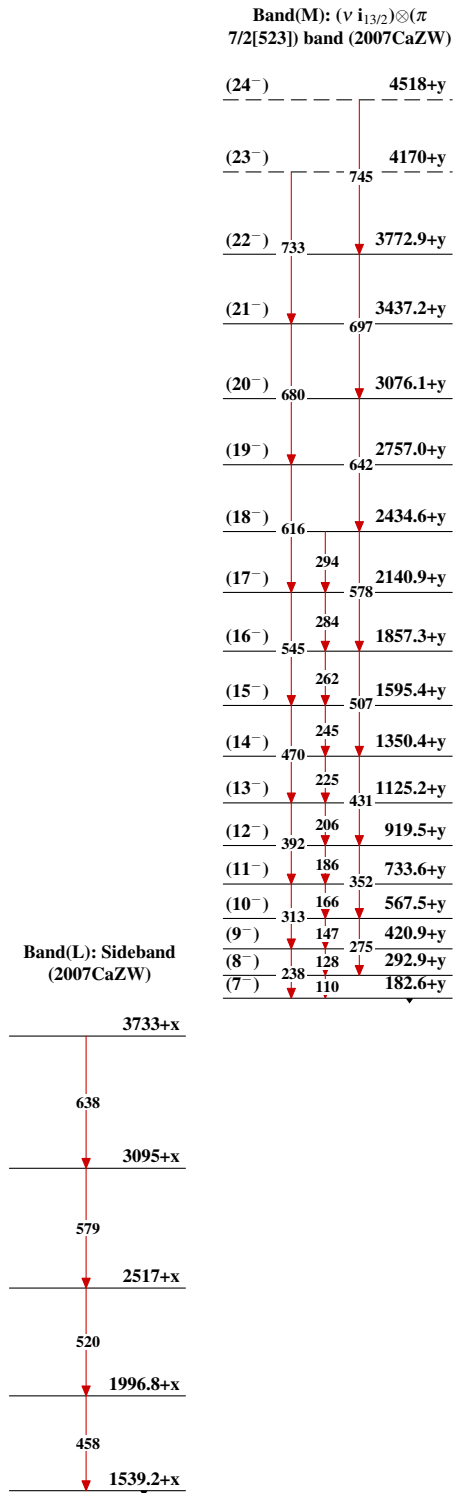
Adopted Levels, Gammas

Adopted Levels, Gammas (continued) $^{168}_{69}\text{Tm}_{99}$

Adopted Levels, Gammas (continued)

Band(K): (ν 7/2[633]) $\otimes$ (π
7/2[404]) band (2007CaZW)

 $^{168}_{69}\text{Tm}_{99}$

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)

Band(P): $K^\pi=(3^-)$ (ν 7/2[633])-(π 1/2[530]) band (1973Pr06)	
<u>(5⁻)</u>	<u>1628</u>
Band(O): $K^\pi=(4^-)$ (ν 7/2[633])+(π 1/2[530]) band (1973Pr06)	
<u>(6⁻)</u>	<u>1590</u>
<u>(4⁻)</u>	<u>1540</u>
<u>(5⁻)</u>	<u>1482</u>
<u>(3⁻)</u>	<u>1434</u>
<u>(4⁻)</u>	<u>1389</u>
Band(N): $K^\pi=(1^+)$ (ν 7/2[633])-(π 5/2[402]) band (1973Pr06)	
<u>(3⁺)</u>	<u>890</u>
<u>(2⁺)</u>	<u>847</u>
<u>(1⁺)</u>	<u>818</u>